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The Relationships between Reporting Format, Environmental Disclosure and Environmental Performance: an Empirical Study

1. Introduction

The evolution of corporate environmental disclosure has been highly topical over the past three decades (Gray *et al.*, 1995; Thorne *et al.*, 2014). Historically, annual financial reports were used as essential documents to communicate with key stakeholders, with environmental reporting viewed as a supplement to financial reporting (Gray *et al.*, 1995). More recently, to meet key stakeholders' growing demands, large companies publish standalone reports to disclose their environmental information (Clarkson *et al.*, 2008; KPMG, 2011; Cho *et al.*, 2015). The standalone reports become remarkable as they "represent a clear engagement of corporations with the increasingly critical issues of environmental and social responsibility" (Michelon *et al.*, 2015, p. 63). Little effort, however, has been made to examine the impact of corporate reporting format on environmental disclosure.

Reporting format, in this paper, refers to where a company discloses environmental information. Following Rupley *et al.*'s (2012) classification, we identify environmental information disclosed in standalone reports as 'companies' environmental reports (CERs)'; we identify environmental information disclosed in annual financial reports as 'non-companies' environmental reports (Non-CERs)'. Also, we identify companies which disclose environmental information in standalone reports as 'CER companies'; we identify companies which combine financial and environmental information together in annual financial reports as 'Non-CER companies'.

This paper seeks to assess whether European companies issue CERs in an attempt to gain and maintain legitimacy with relevant stakeholders. This is achieved by creating and empirically testing a model of the relationships between corporate reporting format, industry membership, environmental disclosure, and environmental performance. Unlike prior research that measures the level of environmental disclosure based on the number of words, sentences, and pages devoted to environmental information (Cho *et al*., 2010), our study develops an environmental disclosure index using the widely used Global Reporting Initiative (GRI) guidelines (Clarkson *et al*., 2008; Bebbington *et al.*, 2012; Mahoney *et al.*, 2013). Greenwashing[1], a new perspective of legitimacy theory, is used to develop research hypotheses. Data is collected from 100 large European Financial Times Stock Exchange (FTSE) companies; hypothesis testing is conducted via structure equation modelling (SEM). Our findings provide strong support to legitimacy theory in that European companies use CERs as a tool of legitimacy to ensure that their values concerning environmental issues are well received by key stakeholders (Throne *et al*., 2014). Our findings also support greenwashing as a new perspective of legitimacy theory: companies in carbon intensive industry use standalone environmental reports to pose as good corporate citizens even when they are not (Adams, 2004; Mahoney *et al*., 2013).

This paper contributes to the literature by adding to the scarce evidence of the relationship between reporting format and environmental disclosure. The paper also enhances our understanding of the intersection of corporate reporting format, industry membership, environmental disclosure, and environmental performance. We suggest that reporting format be considered as a proactive, strategic communication driven activity rather than a decision that managers passively make in response to external scrutiny.

[1] "Greenwashing involves selective disclosure of positive social and environmental actions resulting in misleading and biased reporting" (Mahoney *et al.*, 2013, p. 352).

The remainder of the paper is structured as follows. Section two reviews the extant literature on corporate reporting format, industry membership, environmental disclosure, and environmental performance. Three hypotheses are formulated and introduced into a conceptual model. Section three considers research methods including sample selection, research variables, and data analysis procedure. Section four presents research findings. The final section discusses and concludes the paper.

2. Literature review and hypothesis development

Legitimacy theory has been a popular and dominant theory in the social and environmental accounting literature (Belal and Owen, 2015; Giordano-Spring *et al*., 2015). Many researchers (e.g. Cho and Patten, 2007; Cho, 2009; Ball and Craig, 2010; Tilling and Tilt, 2010; Patten, 2015) empirically test and validate the legitimacy theory and reinforce the argument that companies voluntarily disclose environmental information to gain legitimacy. However, the previous studies "have not always clarified the legitimacy theory nature, approaches, strategy, forms/bases, phases and techniques and the links between various elements of the theory" (Belal and Owen, 2015, p. 1164). Recent studies concerning greenwashing show that companies issue CERs to pose as good corporate citizens even when they are not and this involves selective disclosure of positive social and environmental actions (Mahoney, 2012; Mahoney *et al*., 2013; Belal and Owen, 2015; Michelon *et al*., 2015). Additionally, Lyon and Maxwell (2011) report that CERs are used to influence and enhance stakeholders' perceptions of the relevance of the company's social and environmental actions. We therefore use greenwashing as a new perspective of legitimacy theory to develop research hypotheses in this section.

2.1 Environmental disclosure and reporting format

Whilst there is a general agreement on reporting financial information in annual financial reports, where to disclose environmental information has been debatable (Tilling and Tilt, 2010; De Villers and Van Staden, 2011). In the 1960s and 1970s, annual financial reports were used to communicate environmental information to stakeholders (Deegan and Rankin, 1997). More recently, with increased demand from stakeholders on environmental disclosure, exclusive reliance on annual financial reports has become incomplete and provide misleading picture of environmental disclosure practices (Harte and Owen; 1991; Robert, 1992). Unerman (2000) indicates that there is extensive environmental disclosure taking place outside annual financial reports.

Corporate environmental reporting has evolved from environmental information disclosed in Non-CERs to CERs (Cho *et al*., 2015). Rupley *et al.*'s (2012) study of Canadian companies identifies that the motivations for issuing CERs are to attend stakeholders' increased demands and to respond to greater external scrutiny. KPMG (2011) reports that the use of CERs is considered as a leading practice in the Global Fortune 250 companies. However, some European companies still report social and environmental information in Non-CERs. Giordano-Spring *et al*. (2015), for example, investigate corporate social responsibility activities in 81 French companies in years 2004 and 2010, with 43 companies including environmental disclosure in their annual financial reports in both years. Collectively, we wonder whether there is any relationship between reporting format and environmental disclosure, i.e. whether CER companies tend to provide higher levels of environmental disclosure than Non-CER companies. The following hypothesis is therefore formulated.

H_1: There is a relationship between reporting format and environmental disclosure.

2.2 Environmental performance and reporting format

Legitimacy theory researchers have found a negative relationship between environmental performance and environmental disclosure (Cho and Patten, 2007; Cho *et al.*, 2010; Mahoney, 2012; Mahoney *et al*., 2013). That is, companies with poor environmental performance disclose more environmental information to gain and maintain legitimacy with relevant stakeholders (Cho and Patten, 2007; Giordano-Spring *et al*., 2015). These companies, under great regulatory scrutiny, intend to fully explain their certain environment-damaging activity and corresponding corrective actions that they have taken (De Villers and Van Staden, 2011). In addition, it is worth mentioning that corporate social responsibility theories, including legitimacy theory, assume that environmental disclosure is costly (Mahoney *et al*., 2013) and companies voluntarily disclose environmental information when the benefits of providing CERs outweigh the associated costs (Li *et al*., 1997). Companies with poor environmental performance find it more costly to disclose social and environmental information than companies with better environmental performance (Verrecchia, 1983). Furthermore, greenwashing assumes that poor environmental performance companies are inclined to incur costs to voluntarily disclose biased and misleading social and environmental information in the hope that their stakeholders believe the companies are good corporate citizens (Cho *et al*., 2010; Lyon and Maxwell, 2011). Greenwashing also suggests that companies with poor social and environmental performance records substantially benefit from influencing stakeholders' perceptions of the companies' social and environmental performance (Clarkson *et al*., 2008). These companies may voluntarily issue CERs to gain

and maintain legitimacy with relevant stakeholders (De Villiers and Van Staden, 2011) and maximize the benefits of being good corporate citizens even when they are not (Mahoney *et al*., 2013). Given the preceding discussion, we wonder whether there is any relationship between environmental performance and reporting format, i.e. whether poor environmental performance companies are more likely to disclose environmental information in CERs than in Non-CERs. The following hypothesis is therefore formulated.

H_2: There is a relationship between environmental performance and reporting format.

2.3 Industry membership and reporting format

Different industrial sectors vary in the type and level of environmental reporting. Prior research, for example, has found that companies in carbon intensive industries tend to disclose more environmental information than companies in non-carbon-intensive industries do (Cho and Patten, 2007; Djajadikerta and Trireksani, 2012; Semenova and Hassel, 2016). The underlying assumption is that the companies with a higher pollution propensity face greater pressure from stakeholders and are required to comply with more rigorous legal requirements; therefore, these companies have stronger incentives to disclose environmental information (Cho and Patten, 2007; Clarkson *et al*., 2008; Hassan and Ibrahim, 2012; Cho *et al.*, 2015; Hassan, 2015; Patten, 2015). Legitimacy theorists (e.g. Giordano-Spring *et al*., 2015) suggest that companies facing social and political pressures may use disclosure in an attempt to reduce these pressures. Guidry and Patten (2010) claim that carbon intensive companies may choose to issue CERs to create an image that the companies are socially aware and environmentally friendly. In addition, the greenwashing perspective suggests that companies in carbon intensive industries voluntarily incur costs to issue standalone reports

and engage more in corporate social responsibility activity (Cho *et al*., 2006). Patten (2015) also reports that carbon intensive companies tend to use CERs to "disclose more extensive environmental information of a positive or neutral nature" (p. 46). Given the preceding discussion, we wonder whether there is any relationship between industry membership and reporting format, i.e. whether companies in carbon intensive industries are more likely to issue CERs than companies in non-carbon intensive industries. The following hypothesis is therefore formulated.

H_3: There is a relationship between industry membership and reporting format.

3. Research methods

3.1 Sample selection

European FTSE 300 companies are used for sample selection as these multi-national companies tend to disclosure environmental information (Levy and Newell, 2000). The top 100 companies are initially examined; however, only 21 companies integrate environmental information in annual financial reports. We expand the sample until we reach 50 CER and 50 non-CER companies. Fiscal year 2011 is used as the year of analysis; for companies with fiscal year ended 30th June or later, annual reports for 2010 are used (Alrazi *et al.*, 2011).

3.2 Research variables

3.2.1 Environmental disclosure index

Clarkson *et al.*'s (2008) disclosure index is adapted to measure corporate environmental disclosure with three modifications. Firstly, we remove items which suit only carbon intensive industries, as our sample contains companies in both carbon and non-carbon intensive industries. Secondly, Clarkson *et al.*'s (2008) index is split into hard and soft disclosure with seven subsections; these subsections are removed as they do not suit carbon and non-carbon intensive companies. Thirdly, any duplicated items are removed. As a result, our environmental disclosure index contains 28 items pertaining to five categories: (i) credibility; (ii) environmental performance indicators; (iii) environmental spending; (iv) corporate governance structure and environmental management; and (v) audit and assurance. The first category assesses the credibility of environmental disclosure and contains nine items. The second category contains two items examining the extent to which companies disclose specific environmental performance indicators. The third category assesses company environmental spending and contains three items. The fourth category contains eleven items measuring corporate governance structure and management system for environmental protection. The fifth category contains three items measuring environmental assurance.

Following Alrazi *et al.* (2011), we use a dichotomous scoring system to collect company environmental disclosure data. A value of one is assigned, for example, if a company adopts GRI sustainability reporting guidelines, and a value of zero otherwise. The authors independently review disclosure scores, with any scoring differences discussed and reconciled. In addition, we do not assign weights for disclosure index items, as prior studies show that weighted and un-weighted scoring systems produce similar results (Hodgdon *et al.*, 2008) and assigned weights may not reflect reality (Wallace and Naser, 1995).

3.2.2 Environmental Performance

Following McGinn (2009) and Cho *et al.* (2012b), we measure company environmental performance using environmental impact ratios (EIRs) produced by Trucost, an organization that specializes in quantitative performance measurement. The EIR refers to the proportion of a company's revenue that would be at risk if the company internalizes the external environmental damage costs in relation to the company's operations (McGinn, 2009). To categorize the 100 sample companies into better or poor environmental performers, we compare a company's EIR with Trucost's industry benchmark ratio. The companies with EIR below their industry benchmark are classified as better environmental performers, and poor environmental performers otherwise. The classification is reviewed and confirmed by a Trucost expert.

3.2.3 Industry membership

Using the average carbon emissions to sales revenue ratio, Trucost (2007) classifies all business industries into low, medium, and high carbon intensive industries. For the purposes of this paper, we label companies in the low carbon intensive industries as 'non-carbon intensive companies'; companies in medium and high carbon intensive industries are grouped together and labelled as 'carbon intensive companies'.

3.2.4 Control variables

Many researchers (e.g. Magness, 2006; Clarkson *et al.*, 2008) include financial variables as control variables in explanatory models in environmental accounting research. We therefore consider three financial variables in this paper: (i) company size (measured as the logarithm

of total assets); (ii) return on assets (ROA and hereafter; measured as the ratio of operating income divided by total assets); and (iii) leverage (measured as the ratio of total debt divided by total assets).

Firstly, large companies are more capable of mobilizing resources, than small companies, to solve different environmental issues and integrate financial and non-financial information disclosed to relevant stakeholders (O'Sullivan and O'Dwyer, 2009). Prior studies, for example, find a positive relationship between access to capital markets and disclosure of financial and non-financial information (Clarkson *et al.*, 2008; Frias-Aceituno *et al.*, 2013).

Secondly, the more profitable companies can devote more resources to communicating with stakeholders than the less profitable companies can (Collins *et al.*, 2012; Guidry and Patten, 2012). Empirically, Lang and Lindholm (1993) report a positive relationship between corporate earnings and environmental disclosure. Consistent with Clarkson *et al.* (2008), we use ROA as a financial performance measure and as a control variable in this study.

Finally, Lanis and Richardson (2012) report that there is a positive relationship between corporate debt level and demand for corporate disclosure. As leverage increases, companies disclose more environmental information in order to lower the cost of capital (Leftwich *et al.*, 1981) and reduce the level of information asymmetry (Clarkson *et al.*, 2008). Leverage is therefore considered as the third control variable.

3.3 Data analysis procedure

Data analysis proceeds in six steps. Firstly, demographic statistics of the sample companies are calculated with regard to country, industry classification, and industry membership. Secondly, descriptive statistics of all study variables are calculated, including mean, standard deviation, minimum, maximum, and quartile. Thirdly, scores yielded by our environmental disclosure index are reported. Mann-Whitney U tests are conducted to identify differences that could exist between CER and Non-CER companies with regard to individual index items and category composite scores. Fourthly, chi-square tests are conducted to explore associations between reporting format, environmental performance, and industry membership. Fifthly, Pearson correlation coefficients are calculated between study variables. Finally, hypothesis testing is conducted via structural equation modeling (SEM), an advanced approach to testing hypothesized relationships among measured and latent variables (MacCallum and Austin, 2000). SEM, rather than regression analysis, is used in hypothesis testing as SEM estimates more than one regression equation at a time (Hair *et al.*, 2010) and takes account of measurement errors (Hsu, 2010). SEM is performed via AMOS, a statistical analysis program to conduct multivariate analysis (Arbuckle, 2006).

To assess model fit, we use incremental, absolute, and parsimonious fit indices recommended by Mueller and Hancock (2008). The indices include chi-square (χ^2), degrees of freedom (df), the chi-square-to-degree-of-freedom ratio (χ^2/df), goodness of fit index (GFI), comparative fit index (CFI), the standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA). To perform hypothesis testing, standardized regression coefficient, critical ratio, and corresponding p-value are estimated.

4. Results

4.1 Demographic statistics

Table 1 reports demographic statistics of the sample companies. As shown in the table, the 100 companies are headquartered in 16 countries and represent 10 different industries; 67 companies are in carbon intensive industries and 33 companies in non-carbon intensive industries (Trucost, 2007).

Insert Table 1 here

4.2 Descriptive statistics

Table 2 reports descriptive statistics (i.e. mean, standard deviation, minimum, maximum, and quartile) of all study variables. The variables include four variables specified in the conceptual model (i.e. reporting format, industry membership, environmental performance, and environmental disclosure) and three control variables (i.e. total assets, ROA, and leverage).

Insert Table 2 here

4.3 Analysis of environmental disclosure index items

Table 3 provides 28 environmental disclosure index items pertaining to five categories: (i) credibility (C); (ii) environmental performance indicators (EPI); (iii) environmental spending (ES); (iv) corporate governance structure and environmental management (CG); and (v) audit and assurance (A). As shown in the table, the percentage of the companies disclosing

individual items ranges from 12% (item CG4) to 89% (item CG9), indicating that the companies vary significantly in disclosing different types of environmental information.

Descriptive statistics (i.e. mean score, standard deviation, and rank of mean score) of the index items are calculated for CER and Non-CER companies (see Table 3). A cross-group comparison shows that, with regard to the mean scores of individual items, CER companies ranked first in 20 items and Non-CER companies ranked first in 8 items. Considering the category composite score, CER companies rank first in four categories (i.e. credibility, environmental performance indicators, corporate governance structure and environmental management, and audit and assurance), whilst Non-CER companies rank first in the environmental spending category only. These findings indicate that, in general, CER companies have higher levels of environmental disclosure than Non-CER companies have.

Mann-Whitney U tests, furthermore, identify significant differences ($p<0.05$) between CER and non-CER companies with regard to five items: C2 ($U=850.000$, $p<0.001$), C8 ($U=975.000$, $p=0.020$), CG6 ($U=1000.000$, $p=0.028$), CG7 ($U=1225.000$, $p=0.049$), and A2 ($U=853.500$, $p=0.002$). Marginally significant differences ($0.05<p<0.10$) are found in four items: C3 ($U=1050.000$, $p=0.074$), EPI1 ($U=1075.000$, $p=0.088$), EPI2 ($U=1075.000$, $p=0.097$), and ES1 ($U=1100.000$, $p=0.074$). Considering the category composite score, there are significant differences between CER and Non-CER companies with regard to three categories: credibility ($U=1004.500$, $p=0.044$), environmental performance indicators ($U=1040.000$, $p=0.049$), and audit and assurance ($U=899.000$, $P=0.006$). Collectively, the above findings indicate that CER companies provide higher levels of environmental disclosure than Non-CER companies, thus providing preliminary support to Hypothesis 1.

Insert Table 3 here

4.4 Associations between study variables

Cross tabulation and chi-square tests are conducted to explore the associations between environmental performance and reporting format and between industry membership and reporting format (see Table 4). As shown in the table, considering companies with better environmental performance, 52.0% (39/75) of the companies disclose their environmental information in standalone environmental reports; 48.0% (36/75) of the companies disclose environmental information together with financial information in annual financial reports. Considering companies with poor environmental performance, 44.0% (11/25) of the companies report environmental information in standalone environmental reports; 56.0% (14/25) of the companies reported environmental information with financial information in annual financial reports. The chi-square test shows no significant association between environmental performance and reporting format (χ^2=0.48, p=0.49), thus providing no support to Hypothesis 2.

We furthermore exam the relationship between industry membership and reporting format. Considering companies in non-carbon intensive industry, 39.4% (13/33) of the companies disclose environmental information in standalone environmental reports; 60.6% (20/33) include their environmental performance in annual financial reports. Considering companies in carbon intensive industries, 55.2% (37/67) of the companies disclose environmental information in standalone reports; 44.8% (30/67) of the companies disclose their environmental performance in annual financial reports. The chi-square test shows no

significant association between industry membership and reporting format (χ^2=2.22, p=0.14), thus providing no support to Hypothesis 3.

Insert Table 4 here

4.5 Correlations

Table 5 reports Pearson correlation coefficients between study variables, with p-value provided in parentheses below the coefficients. As shown in the table, there is a significant, negative relationship between reporting format and environmental disclosure (r=-0.169, p=0.045); this result suggests that CER companies are likely to provide higher levels of environmental disclosure than Non-CER companies, thus providing preliminary support to Hypothesis 1. Reporting format is negatively associated with industry membership (r=-0.149, p=0.139) and environmental performance (r=-0.069, p=0.493) respectively; however, the two relationships are statistically insignificant, thus failing to provide support to Hypotheses 2 and 3.

We find a significant, negative relationship between environmental performance and environmental disclosure (r=-0.073, p=0.005). That is, poor environmental performers are likely to provide higher levels of environmental disclosure than better environmental performers, a finding consistent with previous studies in favour of legitimacy theory (e.g. Cho and Patten, 2007; Hassan, 2015). In addition, a negative relationship is found between industry membership and environmental performance (r=-0.209, p=0.034), indicating that companies in non-carbon intensive industries tend to be better environmental performers than

companies in carbon intensive industries do. These interesting relationships are to be further tested via SEM in the paper.

Considering control variables, environmental disclosure is positively related to total assets (r=0.070, p=0.486), ROA (r=0.175, p=0.100), and leverage (r=0.100, p=0.321); reporting format is negatively associated with ROA (r=-0.103 p=0.307) and positively associated with total assets (r=0.063, p=0.531) and leverage (r=0.001, p=0.988). All these relationships, however, are statistically insignificant, thus providing no evidence that the three control variables have influence on endogenous variables specified in the conceptual model. Additionally, variance inflation factors (VIFs) are calculated to assess the multicollinearity of the control variables. The VIF values, ranging from 1.017 to 1.881, indicate no threat of multicollinearity in data analysis (Hair *et al.*, 2010).

Insert Table 5 here

4.6 Hypothesis testing via structural equation modeling (SEM)

The hypothesized relationships are tested via SEM. For comparison purposes (Anderson and Gerbing, 1988), we examine the hypothesized model (Model H) along with three alternative nested models (Models A, B, and C). Model A is built on Model H, with one additional regression path created from industry membership to environmental performance. Model B is built on Model H, with one additional path created from environmental performance to environmental disclosure. Model C is also built on Model H, with two additional paths from industry membership to environmental performance and from environmental performance to environmental disclosure. We add these additional regression paths to the alternative models,

considering the correlation test results and prior literature on the relationships between industry membership, environmental disclosure, and environmental performance (Clarkson *et al.,* 2008; Cho *et al.,* 2012a; Rupley *et al.*, 2012).

Following Cho *et al.* (2012b), we examine the skewness and kurtosis of binary variables used in our study to ensure no threat of non-normality in data analysis. The skewness coefficients ranging from 0.001 to 1.172 (untabulated) are less than the cut-off value of two (West *et al.*, 1995); the kurtosis coefficients ranging from 0.639 to 2.041 are less the cut-off value of seven (West *et al.*, 1995). Mardia's coefficient for multivariate kurtosis is calculated to confirm multivariate normality (Mardia's coefficient=-4.943, Z=-1.954, p=0.0507). Collectively, these results show that the use of binary data does not violate the assumption of multivariate normality and is appropriate for the subsequent SEM.

Table 6 reports model fit statistics including χ^2/df, GFI, CFI, RMSEA, and SRMR. The χ^2/df ratio is the most commonly reported statistic, with a decision rule that χ^2/df should be less than three for a good model fit (Byrne, 2001). A cut-off value of 0.90 is used for GFI and CFI (Jöreskog and Sörbom, 1996; Hu and Bentler 1999; Hoe, 2008). A combinational rule of RMSEA<0.06 and SRMR<0.08 is used, as it is "extremely sensitive in detecting models with unspecified factor co-variance(s)" (Hu and Bentler, 1999, p. 26). All model fit statistics of the four models exceeded their cut-off values, indicating that all the models fit the data well. Furthermore, we compare chi-square statistics of the four models in order to choose the best model, as recommended by Mueller and Hancock (2008). As shown in Table 6, Model A is chosen over Model H for a significant, better fit ($\Delta\chi^2_{ModelA}$=4.411, p=0.036). Models B and C are unchosen as they fail to provide a better fit than Model H ($\Delta\chi^2_{ModelB}$=0.884, p=0.347;

$\Delta\chi^2_{ModelC}$=5.294, p=0.071). Collectively, Model A, as shown in Figure 2, is preferred to the other three models and is therefore used for subsequent hypothesis testing.

Insert Table 6 here

Insert Figure 2 here

Table 7 reports hypothesis testing statistics including standardized regression coefficient, critical ratio, and corresponding p-value. Considering Hypothesis 1, there is a significant, negative relationship between reporting format and environmental disclosure (β=-0.222, p=0.035), indicating that CER companies provide higher levels of environmental disclosure than Non-CER companies do; therefore, Hypothesis 1 is supported. An insignificant relationship is found between environmental performance and reporting format (β=-0.105, p=0.299); therefore, Hypothesis 2 is not supported. Considering Hypothesis 3, there is an insignificant, negative relationship between industry membership and reporting format (β=-0.171, p=0.091). Hypothesis 3 is not supported, although the significance of the relationship narrowly misses the conventional cut-off value of 0.05. In addition, the SEM results show that there is a significant, negative relationship between industry membership and environmental performance (β=-0.209, p=0.034). The relationship indicates that companies in non-carbon intensive industries tend to be better environmental performers than companies in carbon intensive companies do.

The three control variables (i.e. total assets, ROA, and leverage) are included in Model A as exogenous variables, with regression paths to endogenous variables created and tested. As shown in Table 7, all the p-values are statistically insignificant (p>0.05), indicating that

control variables do not confound the relationships specified in model A. That is, the findings of relationships between environmental performance, industry membership, reporting format, and environmental disclosure do not appear to be influenced by total assets, ROA, and leverage.

The SEM results are summarized in Figure 2. As shown in the figure, CER companies tend to disclose higher levels of environmental information than Non-CER companies do (-0.222); non-carbon intensive companies tend to be better environmental performers than carbon intensive companies (-0.209). Additionally, there are negative relationships between environmental performance and reporting format (-0.105) and between industry membership and reporting format (-0.171). The two relationships, however, are statistically insignificant. Statistically, this means that these relationships exist in our sample but cannot be extrapolated to the whole population. The implications of the research findings are discussed in the next section.

4. Discussion and conclusions

This paper seeks to assess whether European companies issue CERs in an attempt to gain and maintain legitimacy with relevant stakeholders. This is achieved by creating and empirically testing a model of the relationships between corporate reporting format, industry membership, environmental disclosure, and environmental performance. Greenwashing as a new perspective of legitimacy theory is used to develop research hypotheses. Data is collected from 100 large European companies operating in both carbon and non-carbon intensive industries. Hypothesis testing is conducted via SEM.

The research results show that there is a negative relationship between reporting format and environmental disclosure. That is, European companies which disclose environmental information in standalone reports tend to provide higher levels of environmental information than those companies which combine financial and environmental disclosure in annual reports. This finding is of importance as it contributes to the literature by adding to the scarce evidence of the relationship between reporting format and environmental disclosure. This finding reinforces Thorne *et al.*'s (2014) observation that companies issue CERs in response to external scrutiny, but also provides strong support to legitimacy theory in that companies use CERs as a tool of legitimacy to ensure that their values concerning environmental issues are well received by relevant stakeholders. This finding is also consistent with Dhaliwal *et al.*'s (2011) argument that that "standalone reports likely provide incrementally useful information for investors to evaluate firms' long-term sustainability" (pp. 62-63).

The results also show that there is a marginally significant ($p=0.091$), negative relationship between industry membership and reporting format. The relationship suggests a strong trend that companies in carbon intensive industries are inclined to disclose environmental information in standalone reports. To some extent, this finding provides support to legitimacy theory in that carbon intensive companies, for their environmentally sensitive nature, are subject to rigorous environmental regulations and thus are driven to disclose extensive environmental information of a positive, or at least a neutral, nature to stakeholders (Cho and Patten, 2007; Semenova and Hassel, 2016). This finding also supports greenwashing as a new perspective of legitimacy theory: European companies in carbon intensive industry use

standalone environmental reports to pose as good corporate citizens even when they are not (Adams, 2004; Mahoney *et al*., 2013).

We find no empirical support to the hypothesized relationship between environmental performance and reporting format. An explanation for this unexpected finding is that, with the recent introduction of integrated reporting[2] by International Integrated Reporting Council (IIRC), large European companies including the sample companies in this paper have considered or recently started to issue integrated reports that contain only information which is regarded as relevant to the creation of sustainable value (Deloitte, 2012). The issuance of integrated reports can be seen as a way to satisfy stakeholders' needs and orientation (Jensen and Berg, 2012; Frais-Aceituno *et al*., 2013). For future research, it would be interesting to conduct a before-and-after study on how the introduction of integrated reporting influences corporate decisions on environmental disclosure and reporting format. Furthermore, our results show that industry membership, although failing to relate to reporting format, negatively predicts environmental performance. That is, companies in carbon intensive industries are likely to be poor environmental performers. This result is consistent with the findings of Cho and Patten (2007) and Patten (2015).

This paper offers three implications to stakeholders. Firstly, the paper provides managers with sufficient knowledge of the conditions under which CER or Non-CER disclosure can be

[2] Integrated reporting, as defined by International Integrated Reporting Council (IIRC), "brings together material information about an organization's strategy, governance, performance and prospects in a way that reflects the commercial, social and environmental context within which it operates… [and] provides a clear and concise representation of how an organization demonstrates stewardship and how it creates and sustains value" (IIRC, 2011, p. 2).

implemented. Reporting format, in particular, should be considered as a proactive, strategic communication driven activity rather than a decision that managers passively make in response to external pressures. Secondly, the paper provides environmental regulators with concrete evidence of different levels of environmental information disclosed by CER and Non-CER companies (see Table 3). CER companies, for example, have higher levels of environmental disclosure than Non-CER companies; the percentage of the sample companies disclosing certain items (e.g. CG4) is marginal. These results indicate that there remains some scope for enhancing mandatory disclosure requirements in relation to the GRI guidelines. Policymakers can usefully use the research findings to formulate supplementary environmental reporting regulations, in order to develop protection mechanisms for vulnerable stakeholders and improve transparency in corporate environmental disclosure. Thirdly, from an academic perspective, this paper enhances our understanding of the intersection of corporate reporting format, industry membership, environmental disclosure, and environmental performance. Greenwashing as a new perspective of legitimacy theory is used to develop hypotheses. The paper, to the best of our knowledge, is the first attempt to examine the impact of reporting format on environmental disclosure.

This paper has a number of limitations. Firstly, our sample companies are large European companies and this could limit the generalizability of research findings. As small companies could have alternative rationale for choosing where, and how, to disclose environmental information (Cho *et al.*, 2012a), future research could be conducted to examine the differences that could exist between small and large companies concerning the relationship between reporting format and environmental disclosure. Secondly, our data consists of company environmental disclosure information in the fiscal year 2011; therefore, the research

findings may not be representative of company environmental disclosure in other years (Alrazi *et al.,* 2011). We call for longitudinal studies examining how the relationship between reporting format and environmental disclosure changes over time. Thirdly, although we follow McGinn (2009) and Cho *et al.* (2012b) using EIRs provided by Trucost, we acknowledge that, like many proxies, the EIRs may not reflect the true underlying attributes that they attempt to capture (Cho *et al.*, 2012a). Fourthly, we do not measure the quality of environmental disclosure in this paper. Future research could exam the relationship between reporting format and the quality of environmental disclosure. Fifthly, our study never consider the legal system or financial structure in which the sample companies operate. Future research could usefully exam the effects of these factors on reporting format and environmental disclosure. Sixthly, considering integrated reporting introduced by IIRC, it would be interesting to conduct a before-and after study on how the introduction of integrated reporting influences corporate decisions on environmental disclosure and reporting format. Finally, we do not consider whether, or how, the relationship between reporting format and environmental disclosure differs across countries where the sample companies are headquartered. Future research could examine the moderating effects of geographical location (Hassan *et al.*, 2013) on the relationship between reporting format and environmental disclosure.

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Table 1: Demographic statistics of sample companies

Country	*Frequency*	*Percent*
Belgium	4	4%
Chile [a]	1	1%
Denmark	3	3%
Finland	1	1%
France	20	20%
Germany	16	16%
Greece	3	3%
Hungary	1	1%
Italy	3	3%
Netherland	5	5%
Norway	1	1%
Portugal	4	4%
Spain	6	6%
Sweden	4	4%
Switzerland	4	4%
United Kingdom	24	24%
Total	100	100%

Industry	*Frequency*	*Percent*
Oil and gas	5	4%
Basic material	9	9%
Industrials	16	16%
Consumer goods	13	13%
Consumer services	11	11%
Healthcare	5	5%
Telecommunications	4	4%
Utilities	8	8%
Financial services	25	25%
Technology	4	5%
Total	100	100%

Industry membership	*Frequency*	*Percent*
Carbon intensive	67	67%
Non-carbon intensive	33	33%
Total	100	100%

Notes: One company is headquartered in Chile.

Table 2: Descriptive statistics of study variables

Variable	*n*	*Mean*	*Std. Dev.*	*Min*	*Q1*	*Median*	*Q2*	*Max*
Reporting format	100	0.50	0.50	0.00	0.00	0.50	1.00	1.00
Industry membership	100	0.67	0.47	0.00	0.00	1.00	1.00	1.00
Environmental performance	100	0.75	0.44	0.00	0.25	1.00	1.00	1.00
Environmental disclosure	100	17.06	6.928	1.00	12.25	18.00	23.00	28.00
Total assets [a]	100	14.62	20.53	0.00	0.19	3.07	25.40	79.15
ROA [b]	100	6.05	9.64	-17.95	0.42	3.96	8.56	55.90
Leverage	100	43.76	64.26	-66.01	9.03	30.06	51.18	386.93

Notes: a. denoted in millions; b. return on assets

Table 3: Environmental disclosure scoring index

		Percentage [a]	*CER (N=50)*			*Non-CER (N=50)*			*Mann-Whitney U test*	
			Mean	*Std. Dev.*	*Rank*	*Mean*	*Std. Dev.*	*Rank*	*U*	*p-value*
1. Credibility (C)			**6.000**	**2.339**	**1**	**5.060**	**2.744**	**2**	**1004.500**	**0.044**
C1	Implementation of ISO14001 at the plant and/or firm level	60%	0.560	0.501	2	0.640	0.485	1	1150.000	0.270
C2	Adoption of GRI sustainability reporting guidelines	70%	0.860	0.351	1	0.540	0.503	2	850.000	0.000
C3	Independent verification/assurance about environmental information disclosed in the CSR report/web	62%	0.700	0.463	1	0.540	0.503	2	1050.000	0.074
C4	Periodic independent verifications/audits on environmental performance and/or systems	59%	0.620	0.490	1	0.560	0.501	2	1175.000	0.342
C5	Certification of environmental programs by independent agencies	57%	0.640	0.485	1	0.500	0.505	2	1075.000	0.113
C6	Product certification with respect to environmental impact	59%	0.620	0.490	1	0.560	0.501	2	1175.000	0.342
C7	External environmental performance awards and/or inclusion in a sustainability index	73%	0.780	0.418	1	0.680	0.471	2	1125.000	0.184
C8	Participation in voluntary environmental initiatives endorsed by EPA or Department of Energy	39%	0.500	0.505	1	0.280	0.454	2	975.000	0.020
C9	Participation in industry specific associations/initiatives to improve environmental practices	74%	0.720	0.454	2	0.760	0.431	1	1200.000	0.410
2. Environmental performance indicators (EPI)			**1.560**	**0.760**	**1**	**1.280**	**0.882**	**2**	**1040.000**	**0.049**
EPI	Companies should report fully on target performance	73%	0.800	0.404	1	0.660	0.479	2	1075.000	0.088
EP2	Performance evaluated against targets	69%	0.760	0.431	1	0.620	0.490	2	1075.000	0.097
3. Environmental Spending (ES)			**0.540**	**0.706**	**2**	**0.640**	**0.964**	**1**	**1245.500**	**0.488**
ES1	Summary of Dollar/Euro savings arising from environment initiatives to the company	14%	0.080	0.274	1	0.200	0.404	2	1100.000	0.074
ES2	Amount spent on technologies, R&D and/or innovations to enhance environment performance and/or efficiency	32%	0.300	0.463	2	0.340	0.479	1	1200.000	0.415
ES3	Amount spent on fines related to environmental issues	13%	0.160	0.370	1	0.100	0.303	2	1175.000	0.277

Table 3: Environmental disclosure scoring index (continued)

		Percentage [a]	*CER (N=50)*			*Non-CER (N=50)*			*Mann-Whitney U test*	
			Mean	*Std. Dev.*	*Rank*	*Mean*	*Std. Dev.*	*Rank*	*U*	*p-value*
4. Corporate Governance structure and environmental management (CG)			**6.420**	**2.879**	**1**	**6.200**	**3.030**	**2**	**1208.000**	**0.387**
CG1	Existence of a department for pollution control and/or management positions for environmental management	32%	0.280	0.454	2	0.360	0.485	1	1150.000	0.260
CG2	Existence of an environmental and/or a public issues committee in the board	55%	0.520	0.505	2	0.580	0.499	1	1175.000	0.344
CG3	Stakeholder involvement in setting corporate environmental policies	42%	0.400	0.495	2	0.440	0.501	1	1200.000	0.420
CG4	Executive compensation is linked to environmental performance	12%	0.120	0.328	1	0.120	0.328	1	1250.000	0.620
CG5	There is a separate section in CSR reports on CG	47%	0.500	0.505	1	0.440	0.501	2	1175.000	0.344
CG6	CSR is part of corporate governance	66%	0.760	0.431	1	0.560	0.501	2	1000.000	0.028
CG7	A statement about the involvement of board directors in environmental responsibility	71%	0.700	0.463	2	0.720	0.454	1	1225.000	0.049
CG8	CEO statement on environmental performance in letters to shareholders and/or stakeholders	67%	0.720	0.454	1	0.620	0.490	2	1125.000	0.198
CG9	A statement of corporate environmental policy, values principles, and environmental codes of conduct	89%	0.920	0.274	1	0.860	0.351	2	1175.000	0.262
CG10	A statement that the firm undertakes periodic reviews and evaluations of its environmental performance	75%	0.780	0.418	1	0.720	0.454	2	1175.000	0.322
CG11	A statement about specific environmental innovations and/or new technologies	75%	0.720	0.454	1	0.780	0.418	2	1175.000	0.322
5. Audit and assurance (A)			**3.600**	**1.629**	**1**	**2.820**	**1.674**	**2**	**899.000**	**0.006**
A1	Audit committee	86%	0.840	0.370	2	0.880	0.328	1	1200.000	0.387
A2	Environmental assurance	78%	2.140	1.161	1	1.460	1.182	2	853.500	0.002
A3	Disclosure about external assurance implemented by accountancy firms	55%	0.620	0.490	1	0.480	0.505	2	1075.000	0.114

Notes: a. the percentage of companies disclosing environmental information

Table 4: Associations between environmental performance and reporting format and between industry membership and reporting format

	CER	*Non-CER*	*Total*	*Chi-square test (χ^2, p)*
Environmental Performance				
Better	39	36	75	χ^2=0.48, p=0.49
Poor	11	14	25	
Total	50	50	100	

	CER	*Non-CER*	*Total*	*Chi-square test (χ^2, p)*
Industry membership				
Non-carbon intensive	13	20	33	χ^2=2.22, p=0.14
Carbon intensive	37	30	67	
Total	50	50	100	

Table 5: Correlations between study variables

		(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
(1)	Environmental disclosure	-						
(2)	Reporting format	-0.169* (0.045)	-					
(3)	Industry membership	0.259 (0.380)	-0.149 (0.139)	-				
(4)	Environmental performance	-0.073* (0.005)	-0.069 (0.493)	-0.209* (0.037)	-			
(5)	Total assets [a]	0.070 (0.486)	0.063 (0.531)	0.137 (0.173)	-0.132 (0.189)	-		
(6)	ROA [b]	0.175 (0.100)	-0.103 (0.307)	0.352** (<0.000)	-0.036 (0.725)	-0.128 (0.204)	-	
(7)	Leverage	0.100 (0.321)	0.001 (0.988)	0.280** (0.005)	-0.026 (0.801)	-0.163 (0.104)	0.310** (0.002)	-

Notes: a. denoted in millions; b. return on assets

Table 6: Model fit statistics

	Model	χ^2	*df*	χ^2/df	*GFI*	*CFI*	*RMSEA*	*SRMR*
1	Model H	19.216	19	1.011	0.952	0.999	0.011	0.0643
2	Alternative Model A	14.805	18	0.823	0.963	1.000	0.001	0.0537
3	Alternative Model B	18.332	18	1.018	0.955	0.998	0.014	0.0583
4	Alternative Model C	13.922	17	0.819	0.965	1.000	0.001	0.0446

Comparison between models	$\Delta\chi^2$	Δdf	*p-value*
Model H and Model A	4.411	1	0.036
Model H and Model B	0.884	1	0.347
Model H and Model C	5.294	2	0.071

Table 7: Hypothesis testing via SEM

Hypothesized Relationship	*Standardized regression coefficient*	*Critical ratio*	*p-value*
RF → ED (H_1)	-0.222	-2.040	0.035*
EP → RF (H_2)	-0.105	-1.038	0.299
IM → RF (H_3)	-0.171	-1.690	0.091
IM → EP	-0.209	-2.124	0.034*

Relationship between control variable and endogenous variable	*Standardized regression coefficient*	*Critical ratio*	*p-value*
TA → EP	-0.100	-0.981	0.327
TA → RF	0.082	0.792	0.428
TA → ED	0.072	0.637	0.501
ROA → EP	-0.021	-0.193	0.847
ROA → RF	-0.057	-0.522	0.602
ROA → D	0.213	1.907	0.056
L → EP	-0.009	-0.084	0.933
L → RF	0.081	0.759	0.448
L → ED	0.001	0.009	0.993

Notes:
RF = Reporting format; ED = Environmental Disclosure; EP = Environmental performance; IM = Industry membership; TA = Total assets; ROA = Return on assets; L = Leverage
* Standardized regression coefficient is statistically significant ($p<0.05$).

Figure 1: The hypothesized conceptual model

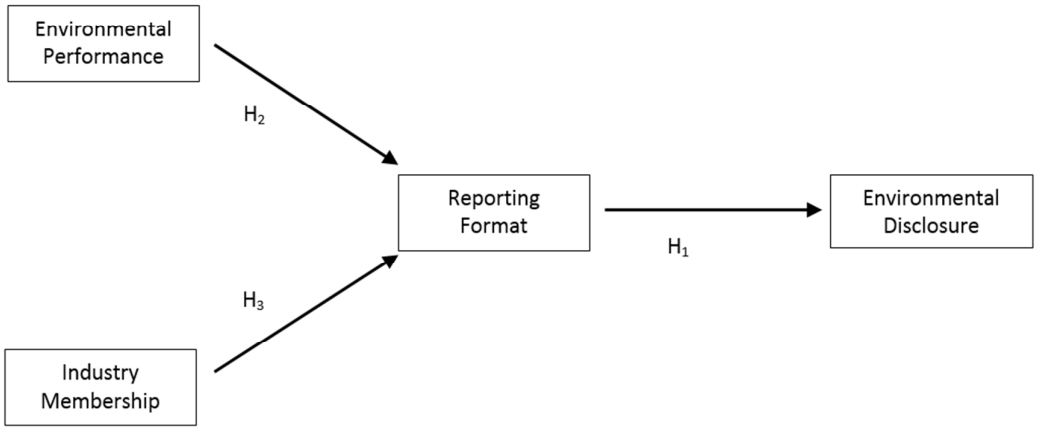
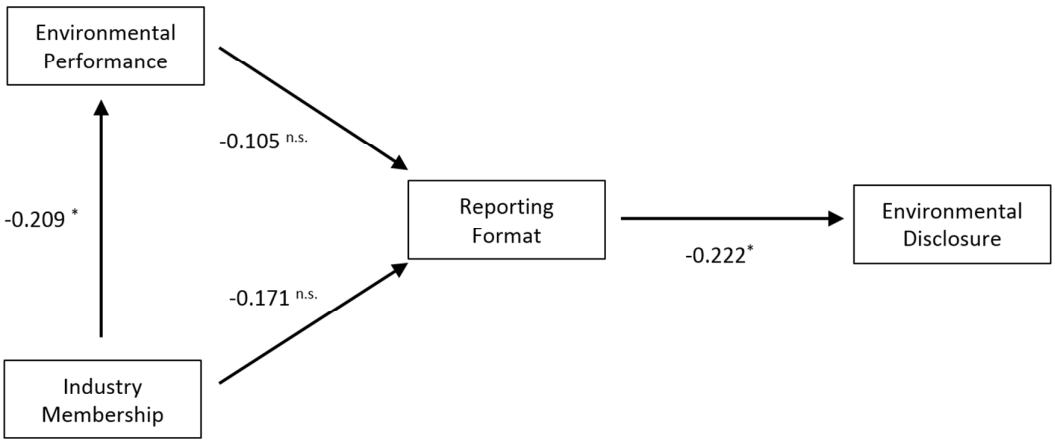


Figure 2: The SEM results (Model A)



* Standardized regression coefficient is statistically significant ($p<0.05$).
n.s. Standardized regression coefficient is statistically insignificant.